



TESViS: An Integrated Data Platform for Exploring, Visualizing, and Subsetting Land Products for Terrestrial Ecology Research

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<https://modis.ornl.gov>



Introduction

The Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC) has extended its suite of integrated, standards-compliant tools and services, the Terrestrial Ecology Subsetting and Visualization Services (TESViS; formerly called the MODIS Tools or MODIS/VIIRS Tools), for working with valuable satellite observations and modeled products for terrestrial ecology research. These data include MODIS, VIIRS, SMAP, GEDI, ECOSTRESS, and ICESat-2, and Daymet. Data transformation, visualization, aggregation, analysis and download for these large and complex data are simplified and easily retrieved through TESViS. This platform makes Earth Observation data more accessible and useable for multi-disciplinary research by facilitating data processing of "big data" for non-remote sensing scientists.

Available Data Products

- We continue to add new data products to TESViS. Today: 49 data products from
- MODIS (32) - Moderate Resolution Imaging Spectroradiometer
 - VIIRS (6) - Visible Infrared Imaging Radiometer Suite
 - GEDI (3) - Global Ecosystem Dynamics Investigation
 - SMAP (2) - Soil Moisture Active Passive (SMAP)
 - ECOSTRESS (2) - ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station
 - SIF (2) - Solar Induced Fluorescence
 - Daymet (1) - North American gridded Daily Weather
 - ATLAS/ICESat-2 (1) - Ice, Cloud, and land Elevation Satellite-2

Figure 1. TESViS Documentation: Available Data Products. For complete list of data products, see <https://modis.ornl.gov/documentation.html>

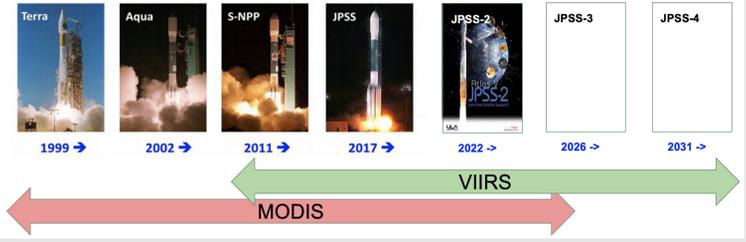


Figure 2. MODIS and VIIRS timeline. <https://viirsland.gsfc.nasa.gov/>

What Does TESViS do?

The ORNL DAAC TESViS provides user-defined subsets of selected MODIS and VIIRS Land Products at a scale useful for field researchers in easy-to-use formats.

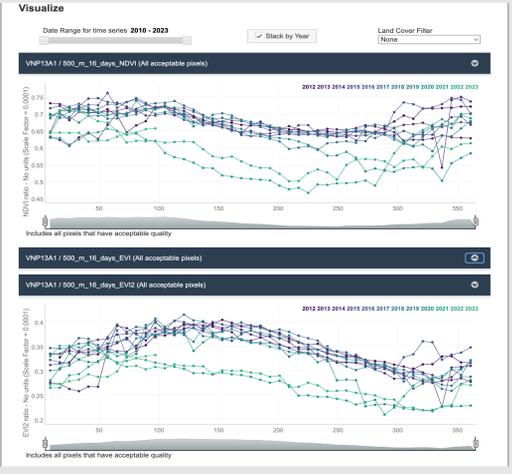
- **Spatial Subset:** Area surrounding any location or known field research sites for up to 201 km x 201 km in size.
- **Temporal Subsets:** Any date range within the time coverage of data
- **Quality Filtering:** Filter data via user-defined quality criteria
- **Reformat:** Get subset results in plan text, GeoJSON, Shapefile, and GeoTIFF. No need to worry about complex HDF-EOS data files.
- **Reprojection:** Get subset results in MODIS sinusoidal projection or Geographic Lat/Lon coordinates, easier for data integration
- **Visualization:** Interactive maps and time series plots
- **Three Ways:** (1) subset at any land location via the Global Subsets Tool; (2) get pre-processed subsets at known field sites via the Fixed Sites Subsets Tool; or (3) automate the subsets via Web Service APIs.

Figure 3. Three ways to subset data through the TESViS

Example Subsets through TESViS Global Subset Tool

Figure 4. Subset vegetation height (ICESat-2 ATL08) and aboveground biomass density (GEDI) near Storck Woods Nature Preserve, IL

Figure 5. 16-day time series of VIIRS NDVI and EVI2 in a 10km x 10km area in Napa Valley, CA, where severe wildfires occurred in 2020. Vegetation was significantly impacted by the wildfires but slowly recovering.



Fixed Sites Subset Tool

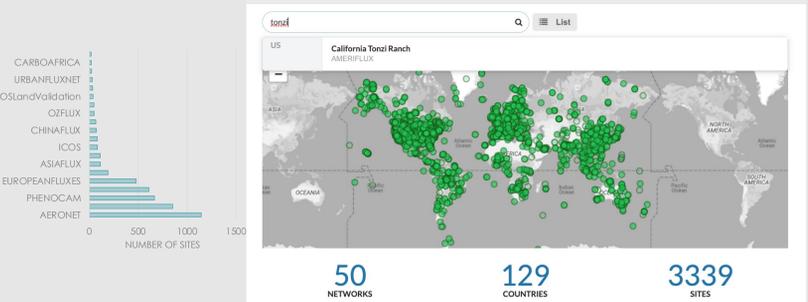


Figure 6. Location of 3000+ sites and distribution across research networks

RESTful Web Service

Resource Path	Input Parameters	Description
/products	NONE	This returns the list of products available. Product shorthand is used.
/product/bands	product	This returns the list of bands available for a product.
/product/dates	latitude, longitude, product	This returns the list of composite dates available for the product. Latitude, Longitude combination.
/product/subset	latitude, longitude, product, startDate, endDate, kmAboveBelow, kmLeftRight	This returns the subset for the location, product, band and date combination. There is a limit of a maximum ten modis dates per request.
/product/subsetOrder	latitude, longitude, product, email, uid, startDate, endDate, kmAboveBelow, kmLeftRight	This returns an Order ID for the subset order. The subset will be sent to the provided email address once processed, and will be available at https://modis.ornl.gov/submitdata/{orderID} . There is no limit on number of dates a user can request.

Figure 7. TESViS Global Subset RESTful API User Interface. TESViS also provides a Fixed Sites API User Interface. See more details: https://modis.ornl.gov/data/modis_webservice.html

Usage and Applications

TESViS has been used to support a wide range of terrestrial ecology research and beyond. It has been cited in 700+ publications for environmental sciences, ecology, agronomy, forestry, water resources, biodiversity, etc.

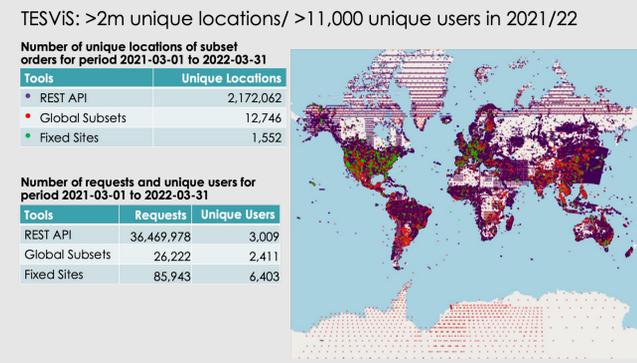


Figure 8. Usage metrics of TESViS and unique subset locations

Please Cite the Tool

Citation Policy: When using subsets of TESViS from the ORNL DAAC, please cite both the specific tool(s) used and the specific data product(s). The citation is also sent in the email (as plain text and BibTeX file attachment) along with the data retrieval instructions after the order is processed.

Resources:

- <https://modis.ornl.gov/resources.html>
- <https://daac.ornl.gov/resources/learning/>
- <https://forum.earthdata.nasa.gov>

Contact: uso@daac.ornl.gov